TITLE OF THE INVENTION

STEREO MICROSCOPE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of application serial No. 10/320,385 filed Dec. 17, 2002 to a HEAD MANIPULABLE BINOCULAR MICROSCOPE SUPPORT.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT " Not Applicable "

BACKGROUND OF THE INVENTION

[0002] There is a need for a low cost, light weight stereo microscope having a set of oculars wherein a clinician looking into the oculars views comfortably and naturally an object to be magnified or observed. It is desirable that the two lines of sight from the clinician's eyes through the oculars and the microscope to the object to be magnified or observed lie in a common plane. This forms a comfortable situation for the clinician since when the eyes of the clinician are removed from the oculars, the clinician is looking directly at the object to be observed. Also, there is a need in a stereo microscope for an inexpensive light source and camera.

BRIEF SUMMARY OF THE INVENTION

[0003] The invention pertains to a stereo microscope wherein both lines of sight from the eyes of a clinician pass through a housing to an object to be observed or magnified and lie in a common plane. The microscope also has an LED light source and a digital camera within its housing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] FIG. 1 shows a side elevation of the stereo microscope.

[0005] FIG. 2 is a plan view of the stereo microscope.

[0006] FIG. 3 is an exploded view of the stereo microscope.

[0007] FIG. 4 is a support system for the microscope.

DETAILED DESCRIPTION OF THE DRAWINGS

[0008] The stereo microscope of this invention includes a housing or hollow elongated body 26 having a pair of oculars 27. Each ocular has a lens assembly 28 and is pivotally mounted at 29 and 30 so that both oculars move in a common plane. Adjacent an end of each ocular is a prism assembly 31. An objective lens 32 is mounted in the housing at an end opposite the pair of oculars. Located between the prism assemblies 31 and the objective lens 32 is a lens magnification changer 33. The lens magnification changer is rotatively mounted at 34. A first series of bores 35 extend diametrically through the lens magnification changer 33 and with all bores located in a common plane. Two or more of these bores contain a lens assembly. A second series of bores 36 extend diametrically through the lens magnification chamber 33 and all located

in a common plane. Two or more of these second series of bores contain a lens assembly.

[0009] A digital camera 38 may be used with the stereo microscope. The camera is positioned adjacent an end of the housing. The lens magnification changer includes a third series of bores 37 located axially between the first 35 and second 36 series of bores, about the periphery of the lens magnification changer in a common plane, and extending diametrically through the lens magnification changer. This third series of bores 37 may all contain a lens assembly, or one or more may not contain a lens assembly. Light passes through the objective lens 32, one of the bores 37 of the lens magnification changer, and to the camera 38. There is a spring biased rod 39 that mates with one of a plurality of indents in an axis of the lens magnification changer to align bores of the lens magnification changer with the line of sight and the camera. A knob 40 is used for rotating the lens magnification changer.

[0010] In Fig. 2, an alternate modification of the camera is disclosed in dashed lines. A beam splitter 41 may be located in a line of sight for an ocular. Part of the light would pass through to the ocular and part of the light would be reflected to a camera 42 located at a side of the stereo microscope.

[0011] Located at one end of the housing 26 and adjacent the objective lens 32 is an LED light source 43 which may be either one or a plurality of LEDs. However, other light sources may be used. A suitable reflector 46 is positioned in back of the light source 43 and a light filter 44 is located in front of the light source. The light filter is hinged at its upper part and attached to a lever 45 which is located outside the housing 26. By controlling the lever 45, the filter can be positioned either in front of the light source or out of the way.

[0012] Housing 26, as shown in Fig. 3, includes a body portion 46 on which the lens magnification changer 33 is mounted. Rigid straps 47 and 48 are attached to the body portion 46 by suitable means such as rivets or screws. Upper housing shell 49 and lower housing shell 50 are attached about body portion 46 by screws 51 which are screwed into lower body portion 50. Objective lens 32 is held in place in the housing 26 by one or more screw threaded members 51 which are screwed into an end of the housing 26. A plate 52 which is positioned in a groove in the upper housing shell 49 and mates with the lower housing shell helps to complete the housing 26.

[0013] Fig. 4 shows an apparatus support and guidance system for the stereo microscope and is a separate subject of invention as disclosed in copending application serial No. 10/320,385 filed Dec. 17, 2002. A housing 6 on wheels includes a telescoping device 5. The telescoping device may be raised or lowered by means of a rack and pinion, motorized screw or hydraulic piston and cylinder for example. The apparatus may also be supported by attaching an arm of the apparatus to a wall or ceiling mount or to an adjustable in length mount connected to a dental chair accessory pole.

[0014] A system of arms connects a microscope 18 to the telescoping portion 5. A first arm 1 is connected to the telescoping portion 5 at one end and to a second arm 2 at the other end by a bearing 8. The second arm 2 is connected to a third arm 3 by means of a bearing 9 including a vertical extension 10. The third arm is pivotally connected to the vertical extension at 11. A compressed gas spring is pivotally connected at one end to the vertical extension 10 at 12 and at an opposite end to the third arm 3. The compressed gas spring applies a counterbalancing force

which is required for the setting of an equilibrium condition upon alteration of the third arm in a vertical direction. The third arm 3 has a plurality of perforations such as 14 wherein the attached location of the compressed gas spring can be varied to adjust the force applied by the compressed gas spring against the arm 3. A fourth arm 4 is attached to the third arm 3 at one end by a ball joint 15 and the opposite end to the microscope 18 by another ball joint 16. The ball joint 16 includesa combination cage and slide 17 attached to the microscope 18 as shown in Fig. 3. The cage and slide 17 extends through an opening 53 in the upper housing shell 49 and is attached to the rigid strap 47 by screws 54. The cage can move on the slide to help balance the microscope and can be held in place by a locking screw. Arm 2 can rotate 360 degrees at bearing 8, arm 3 can rotate 360 degrees at bearing 9 and arm 4 can rotate 360 degrees at both ball joints 15 and 16. The arm 4 can pivot at ball joints 15 and 16 in any direction.

[0015] An extension means 21 includes splined or noncircular in cross-section telescoping members which may be adjusted in length and locked in position by a setscrew 24. The extension means 21 is pivotally connected to both the microscope and to a head harness so that it can be adjusted relative to the head harness and microscope and held in position by lock screws 22 and 23. The head harness includes a padded member 20 and straps19 attached about a clinician's head. The straps may be tightened by a belt-buckel arrangement, VELCRO members, a knob type tightener as shown at 25 or other conventional means.